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DSCC Annual Tire Conference

Land Vehicle Tire Qualification

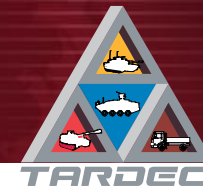
March 24, 2011

UNCLASSIFIED: Dist A. Approved for public release

Report Documentation Page			Form Approved OMB No. 0704-0188		
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1. REPORT DATE 24 MAR 2011		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE Land Vehicle Tire Qualification			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) US Army RDECOM-TARDEC 6501 E 11 Mile Rd Warren, MI 48397-5000, USA			8. PERFORMING ORGANIZATION REPORT NUMBER 21589		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) US Army RDECOM-TARDEC 6501 E 11 Mile Rd Warren, MI 48397-5000, USA			10. SPONSOR/MONITOR'S ACRONYM(S) TACOM/TARDEC/RDECOM		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S) 21589		
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES The original document contains color images.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES 35	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



LAND VEHICLE TIRE QUALIFICATION



- Qualification for Land Vehicle Tires for Tire Privatization Initiative (TPI) Contract
- Classifications
 - SAE J2014 / Manufacturer's Approved Part No.
 - Cooperative Approved Tire List (CATL)
 - Product Description (ZZ-T-391, ZZ-T-410, ZZ-T-1619)
- Qualification Process Dependent upon Classification
- Vehicle qualification testing inherently qualifies OEM tire for that vehicle system
- Replacement tires qualified via testing requirements per classification

SAE J2014 / Manufacturer's Approved Part No. Tire Qualification Process

- Need or interest established for additional tire source for vehicle system*
- Testing criteria defined based on vehicle performance requirements (Vehicle Mission Profile, Military Requirements, etc.)*
- Testing funded by tire manufacturer unless Govt. determines critical need for second source*
- SAE J2014 test costs prohibitive (est. \$800K-\$1.4M)*
- Upon successful completion of testing/PM approval, tire P/N added to specific NSN*

SAE J2014:

- Society of Automotive Engineers' specification
- Pneumatic Tires for Military Tactical Wheeled Vehicles
- Developed by SAE Military/Industry Tire Technology Subcommittee
- Describes test and test methodology to evaluate tire and tire/vehicle related performance
- Tests required based on vehicle system and mission profile
- Used as basis for procurement for military vehicles
- Currently being updated per SAE Truck and Bus Military Industry Tire Task Force

SAE J2014:

- Tire Traction 4.6
- Vehicle Evasive Maneuver 4.7
- Bead Unseating 4.8
- Rolling Resistance 4.9
- Dimensional Criteria 4.10
- Ride Handling and Stability 4.11
- Mechanical Reliability 4.13
- Tire Treadlife Durability 4.14
- Comparative Stopping Distance 4.15
- Tire Single Wheel, Skid-Resistance 4.16

SAE J2014 4.6 Tire Traction

- Traction performance of candidate tire relative to reference tire.*
- Mud / Sand /Snow*
- No less than 95% of reference tire.*

SAE J2014 4.7 Vehicle Evasive Maneuver

- NATO Lane Change*
- Wet /Dry Pavement*
- Comparison to reference tire*
- Mixed Fitment (reference tire & candidate tire on same vehicle)*

SAE J2014 4.8 Bead Unseating

- Determine tire/rim slip, air loss or bead unseating at minimum recommended inflation pressure*
- Figure 8 course*
- Sand (moisture content as prescribed)*
- Candidate tires as prescribed air loss (same as reference)*

SAE J2014 4.9 Rolling Resistance

- In Accordance with SAE J1269*
- Rolling Resistance Coefficient of candidate tire not exceed reference tire by more than 5%*

SAE J2014 4.10 Dimensional Criteria

- Measurements of Candidate Tire compared to Reference*
- Overall diameter, section width, weight, revolutions per mile, bead width
- Additional: deflection, spring rate, footprint at various loads/inflations
- Comply with T&RA or ETRTO
- Meet requirements for compatibility with reference tire

SAE J2014 Ride Handling and Stability 4.11

- Candidate tire must provide acceptable ride, handling and stability characteristics*
- Various course profiles specific to mission profile*
- Jury Ride evaluation equal or above reference tire rating (may be supplemented by instrumented data)*

SAE J2014 4.13 Mechanical Reliability

- Tire durability in off-road conditions
- Durability course: washboard (as prescribed)
rock terrain (as prescribed)
cross-country (hills/curves with embedded stones)
- 2400 miles duration (Inspection as prescribed)
- Criteria:
 - Candidate tire must exceed 95% of reference tire mileage
 - Candidate tire: less than two like failures or less than reference tire
 - Candidate tire equal to better than reference tire in Performance (*heel/toe wear, chunking, cutting, stone retention, physical appearance*)

Failure Criteria:

- Broken or displaced belts or breakers*
- Tread separation exposing casing
- Ply separation
- Bead damage / separation
- Severe open splices and/or liner separations
- Tire induced loss of air
- Exposed or broken casing
- Bulges in tread or sidewall

SAE J2014 4.14 Tire Treadlife Durability

- 10000 miles duration
- Evaluate tread wear performance of candidate tire*
- Measurements at prescribed intervals*
 - Tread depth at centerline & shoulder*
 - Diameter, section width, tread arc width*
- Conducted on courses required for mission profile*

Criteria:

- Candidate tire exceeds 95% of reference tire mileage*
- Candidate tire less than two like failures or less than reference tire*
- Candidate tire equal or better than reference in Performance (heel/toe wear, chunking, cutting, stone retention, physical appearance)*

SAE J2014 4.15 Comparative Stopping Distance

- Comparison of stopping distance of candidate with reference tire.*
- Wet / Dry Surface
- Candidate tire stopping distance no more than 5% greater than reference tire
- Mixed Fitment

SAE J2014 4.16 Tire Single Wheel, Skid-Resistance

- Candidate tire on test rig vehicle*
- ASTM E274
- Candidate tire peak and slide performance no less than 95% of reference tire*

Other tests may be required in conjunction with SAE J2014 or specific to the vehicle system

Run flat test

- Performance of tire as part of tire/wheel/run flat system

Steady State Handling SAE J2181

- 200 ft diameter course
- Understeer gradient

Thermal Profiling

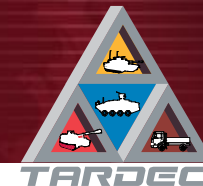
- Temperature measurements at centerline / belt edge

Backward Stability ANSI B30.5c

- Crane Application



COOPERATIVE APPROVED TIRE LIST (CATL)



- CATL offers a list of approved tires qualified through limited testing
- CATL 1922 – Highway Tires
- CATL 1923 – Off Road Tires
- Grouped by Application (passenger, truck, etc.)
- Approved Manufacturers with tire brands listed

History – Federal Tire Program/ Cooperative Tire Qualification Program (CTQP)

- (1966-1996) Qualified Products List (QPL) program for tires, managed in-house by the General Services Administration (GSA)
 - Past Names (Federal Tire Program, Qualified Products List, Quality Assurance Facility Inspection Program)
 - Past Standards
 1. Spec ZZ T-381 (Highway Tires)
 2. Spec ZZ T-1083 (Off Road Tire)
 3. Spec ZZ T-441 (Retreads)



(History cont'd)

- (1997-2005) CTQP- Cooperative Tire Qualification Program
 - Contractor managed with government oversight
 - CATL – Cooperative Approved Tire List
 - Qualified tire products, manufacturers and retreaders are added to the CATL
 - The CATL is used by government agencies when purchasing tires and retreads
 - CPQC – Cooperative Plant Quality Certification
 - Standards Used
 - ASTM F 1922 (Highway)
 - ASTM F 1923 (OR)
 - CTQP 441 (for Retreads)
- (2005- Present) CTQP private contractor (ACTS) replaced with DLA to have overall management responsibility and Engineering Support Agency (ESA) remains with TARDEC

- Historically, CATL used by government agencies when purchasing tires and retreads
 - Department of Defense (Land Vehicle Contract)
 - U.S. Postal Service
 - Department of the Interior
 - State, city and local governments
- Competitive within the approved sources
- DOD Land Vehicle Contract (163 NSNs)
- More cost effective than to test every NSN

Standards Used

- ASTM F-1922, Standard, Test Method for Highway Tires
- CTQP-AM-1922 Administrators Manual for Highway Tire Tests

Test Requirements

- 20,000 miles - highway with limited gravel for certain applications
- Reference tires run on the same vehicle at the same time as candidate tires
- Tread Depth measurement of reference and candidate tires taken at specified intervals
- Candidate tires must complete the test and tread wear projections must be at least 95% of that of the reference tire

CATL 1922 Tires

Groups

- Group 1, passenger car tires
- Group 2, light truck tires
- Group 3, medium and heavy truck/bus tires, and Special Application tires

Standards Used

- ASTM F-1923 Standard Test Method for Off Road and Low Speed Tire
- CTQP-AM-1923 Administrator Manual for Off Road and Low Speed Tire Tests

Test Requirements:

- Off-road, low-speed tires measured and tested in the laboratory.
- Plunger Energy, tensile strength, ultimate elongation, and dimensional criteria must fall within specified limits.

Classification:

Group 1 Off-the-road tires used in intermittent highway service

Class ML (mining and logging)

Group 2 Earthmoving Mining and Logging tires used for short hauls, fork-lift tires, mobile cranes, shovels, mining cars, front end loaders and dozers.

Class C - (compactor)

Class E - (earthmoving)

Class L - (loader and dozer)

Group 3 – Road Grader

Class G - (grader)

Class TG - (traction grader)

Test Evaluation Criteria

- CATL 1922 (20K Treadwear Test)
 - With control tires performing at 100% level for tread wear, the candidate tire must meet 95% projected mileage
- CATL 1923
 - Dimensional Criteria
 - Plunger Energy
 - Tensile Strength
 - Tread (1700 PSI)
 - Sidewall (900 PSI)
 - Ultimate Elongation
 - Tread (400% minimum)
 - Sidewall (300% minimum)

Hidden Defects Inspection:

- A visual inspection of two tires
- One tire shall be cut into eight equal cross sections, with each section being cut circumferentially in midcrown and on each side of the crown at the point of maximum shoulder thickness; any additional cuts deemed necessary for complete inspection of the tire shall be made.
- The cut sections shall then be inspected for evidence of hidden defects such as separation of tread, ply, or bead in accordance with MIL-STD-1224.

No. Characteristics of tires for exam	No. of tires for exam	Test Acc/Rej	Retest Acc/Rej
Visual exam, major <u>Defects (all groups)</u>	3	0/1	0/1
Visual exam, minor <u>Defects (all groups)</u>	3	1/2	0/1
Tire overall diameter (all groups)	3		
Skid depth (all groups)	3		
Tire overall width (all groups)	3		
<u>Total examinations</u>	9	1/2	0/1
Breaking energy* (all groups)	1		
Hidden defects (all groups)	2		
<u>Total examinations</u>	3	1/2	0/1
Total Tensile strength	3		
Tires Ultimate elongation	3		
<u>=3 total examinations</u>	6	0/1	0/0

*Does not apply to Style Y

Qualification

- For Style X Tires, Group 1, Group 2, and Group 3 will be tested. Qualification will be extended to other classes of tires in the same group which are of equal or higher quality level of construction and materials as certified by the manufacturer
- Qualification may be extended to a tube-type brand or model, provided it is of equivalent construction (design and materials), with the exception of the bead, to the tubeless model qualified. Using this same provision, the tube-type shall qualify the tubeless model or brand.

Qualification (cont'd)

- For Style X tires, qualification may be extended to other manufacturer's production points of a particular group provided the standards and methods of quality control are equivalent at each point of manufacture. The brand or model must be of equivalent compounds and construction from both locations.

PURSUIT AND EMERGENCY HIGH SPEED TESTING

- PASSENGER CAR - SAE J 1561 OR ECE 324 Reg 30
- LIGHT TRUCK - SAE J 1633

High Speed Tire Testing:

- Tires are tested for specified time in the laboratory by running against a prescribed diameter wheel at specified load and speed.
- "The tire manufacturer shall supply to the Administrator the test results, by tire model and size, and certification that the particular tire model and size successfully met the requirements of the subject tests."
- "Govt may grant waiver for additional sizes in same design if contractor provides sufficient evidence (construction information, internal testing, etc.) that these additional sizes meet speed rating."
- TEST FACILITIES
 - STANDARDS TESTING LABS
 - AKRON RUBBER DEVELOPMENT LABORATORY
 - SMITHERS SCIENTIFIC SERVICES, INC.

Termination of test (P&EHS Testing)

The test may be considered terminated by one of the following.

- completion of predetermined final step
- tire failure

Upon visual inspection of the dismounted tire, any visible evidence of the following constitutes tire failure:

- tread separation
- cord separation
- ply separation
- bead separation
- sidewall separation
- chunking
- innerliner separation
- cracking

Light Truck Off Road Severe Application (ORSA)

- 2400 Miles of operation for all tires.
- X-ray Examination Bead-to-Bead 360° around test tires at the beginning and conclusion of the test
- Tread depth measurements, outside diameter, section width, tread radius, tread arc width, and Shore A will be taken at 0, 1931, and 3862 km (0, 1200, and 2400 miles).

Pass/Fail Criteria

- Two Like Failures occur within the prescribed test mileage
- Anomalies experience by the control tire due to testing will be acceptable anomalies experienced by the test candidate tire(s)
- All tires tested with projected mileage equal to or higher than 95% of the projected mileage of the established control tire shall be considered qualified for listing on the Administrator's Cooperative Approved Tire List (CATL), issue in effect.

ORSA Major Categories and Percentage of Test to be Conducted in Those Categories

Environment	Percent of Total Test Mileage	Kilometers (Miles) per Shift	Total Kilometers (Miles) at End of Test
Paved road, high speed	6	10 (6)	232 (144)
Paved road, hill and curve	6	10 (6)	232 (144)
Degraded pavement (pot-holes, loose surface, etc.)	8	13 (8)	309 (192)
Secondary road, gravel road	25	40 (25)	965 (600)
Secondary road, embedded rock	25	40 (25)	965 (600)
Level cross-country track, mild	10	16 (10)	386 (240)
Level cross-country track, severe	10	16 (10)	386 (240)
Hilly cross-country track, mild	7	11 (7)	271 (168)
Hilly cross-country track, severe	3	5 (3)	116 (72)

Pass/Fail Criteria (cont'd)

The following anomalies will be considered for pass/fail criteria in comparison to the control tire:

- Severe heel/toe wear
- Broken belts
- Broken cords
- Severe tread chunking
- Tread separation
- Ply separation
- Bead damage separation
- Open splices
- Loss of air from cavity
- Exposed casing structure cord
- Bulges in tread or sidewall
- Out of Round condition

RETREADING ISSUES

- For testing, all tire casings furnished shall meet applicable requirements of Federal Motor Vehicle Standards 139, 109, 110, 117, 119 and 120 part 574; part 575.104; as well as state and local regulations, as applicable.
- Casings furnished for Style Y tires shall be from a tire purchased new in the United States which the original tread rubber has been worn off while in service in the United States.
- The retread facility's identification code shall be located on the same sidewall and as close as possible to the original casing manufacturer's DOT code.
- Any speed category codes and M&S designations that were placed on the casing sidewall by the new tire manufacturer shall also be removed.
- Retreaded tires submitted for testing shall meet the requirements in the Administrator's Approval and Requirements Manual for Tire, Pneumatic: Retreaded and Repaired (CTQP-441)

REQUALIFICATION

- Once a tire manufacturers particular model/retreading process of tire has been qualified, it shall remain qualified and be listed on CATL 1922 for a period of: four years for Group 1, five years for Group 2, and six years for Group 3. The period of qualification for CATL 1923 is 10 years for all groups.
- At the end of the appropriate time period, the manufacturer shall requalify the original tire model/retreading process which was submitted for qualification or any other tire model to which qualification was extended based on the qualification of the original tire model.

Tires defined by Product Description (ZZ-T-391, ZZ-T-410, ZZ-T-1619)

- Tire must meet product description and requirements by referenced specification*
- Commercial item (agricultural, mining, skid steer, solid tires)*
- Dimensional requirements (tire diameter, width, tread depth) must be in accordance with industry standards (T&RA, ETRTO)*
- Tire must address additional requirements as defined in specification (ozone resistance, identification, carcass strength, etc)*

QUESTIONS?

